BRITISH MEDICAL JOURNAL
LONDON
SATURDAY FEBRUARY 14 1953

SURGERY OF THE HEART

On another page Drs. M. Campbell and D. Deuchar discuss the results of treating 200 patients suffering from congenital heart disease by means of anastomotic operations as described by Blalock and Taussig in 1945. They use the term morbus caeruleus, for, except in patients who die, an exact anatomical diagnosis may be impossible. Probably over four-fifths had Fallot's tetralogy, and the best results were obtained in these. In this condition there is stenosis of the outflow tract of the right ventricle, sometimes of the pulmonary valve, more often below it in the infundibulum; the interventricular septum is patent, the opening lying in the upper part; the aorta is dextroposed, so that it receives blood from the right ventricle as well as from the left; and the right ventricle is enlarged. As a result of the pulmonary stenosis, not enough blood reaches the lungs. The aim of the operation is to increase the pulmonary blood flow by making an anastomosis between a systemic artery and one of the pulmonary arteries.

The patients treated were mostly children, rather more boys than girls; three-quarters of them were between 5 and 14 years old. The principal symptoms are cyanosis and breathlessness on exertion, resulting in a disability that may be severe, so that the child may not be able to walk more than a few yards. Three-quarters of the patients were severely disabled in this way.

The diagnosis was ordinarily made by clinical examination combined with electrocardiography, radioscopy, and blood counts. Sometimes special investigations were used; they all subject the patient to discomfort and some risk. Angiocardiography may confirm dextroposition when the diagnosis is in doubt by showing early filling of the aorta, and it may help in deciding on operation by demonstrating the presence of pulmonary arteries and the anatomy of systemic branches. Levels of arterial oxygen saturation may be determined on blood obtained by puncturing the femoral or brachial artery, before and after breathing oxygen, but the information obtained does little more than confirm the clinical finding of cyanosis. A catheter may be passed through a superficial arm vein into the various chambers of the heart, and it can usually be made to enter the pulmonary artery. The position of the catheter can be seen with fluoroscopy; sometimes the presence of a patent septum or a pulmonary stenosis can be deduced; blood samples can be withdrawn for estimations of oxygen saturation; and the most valuable information to be obtained is from the pressure readings in the various chambers and vessels. In patients with Fallot's tetralogy there is always evidence of a shunt from the right to the left side of the heart.

The operation performed on Campbell and Deuchar's patients was, when possible, end-to-side anastomosis of the left subclavian artery to the left pulmonary artery. Occasionally it was necessary to do an end-to-end anastomosis, but this is less beneficial because the systemic blood then reaches only one lung. Nearly all the patients have been followed up for over one year, some of them for five years. Good or very good results were seen in 136 (68%); 17 were improved; 6 were improved but later died, 2 from causes probably unrelated; 17 have not changed; and 24 (12%) died from the operation. Many of the patients now lead normal or practically normal lives, earning their living or attending ordinary school. In 11 patients it was found that anastomosis could not be done, usually because there was no suitable pulmonary artery. Of the 24 patients who died from the operation, 13 had a lesion other than an uncomplicated Fallot's tetralogy, and 5 of the remainder were aged 19 or older. Nearly all those who died caused anxiety during the operation, and all except one died within 72 hours of its completion. The figures may be compared with those of Belcher and Sellors,[1] who reported 70 cases with 8 operative deaths, and very obvious benefit in 42, and with the large series of Taussig's[2]—1,000 cases with a 16% mortality and good results in 78%.

After an anastomosis is established a murmur can be heard resembling that in patent ductus arteriosus; it is continuous, with systolic accentuation, best heard below the inner half of the clavicle but widely conducted. A thrill is unusual. Clubbing of the fingers regresses, but seldom disappears. Cyanosis becomes less; but it is nearly always still present after exercise, and usually just visible at rest. The pulse pressure is sometimes increased. The raised haemoglobin falls, approaching normal; there is a wide range of readings both before and after operation, the average final value in the patients with good results being 102%. The presence of an anastomosis increases the work that the heart must do; it therefore enlarges. In most cases the heart enlarges fairly rapidly in the

[1] *Lancet*, 1950, **2**, 887.
[2] Taussig, H. B., *et al.*, *Trans. Ass. Amer. Phys.*, 1951, **64**, 67.

first month or so; the size then remains stationary. On the whole patients with large hearts before operation do not do so well; and too large an anastomosis is suspected in patients whose hearts continue to enlarge after the initial increase: the onset of congestive failure is then a serious possibility. Symptoms improve immediately after operation, and the main changes are usually established within a few months. Subsequent deterioration, or evidence that the anastomosis is becoming smaller, have been very rare. All patients have lost their radial pulse on the side of operation, and no blood pressure can be registered in this arm, but there have been no more serious effects of devascularization. Horner's syndrome and minor cerebral thromboses have been the only postoperative complications, both uncommon. No patient has developed bacterial endocarditis, another complication that was expected, but five have had cerebral abscesses—a common event in the untreated disease.

Campbell and Deuchar do not report any results of direct operations for pulmonary stenosis—division of a stenosed valve by a valvulotome or resection of an infundibular stenosis. These operations are now accepted as useful in treating isolated pulmonary stenosis, but they can also be applied to many cases of Fallot's tetralogy, the commoner condition. They have the attraction of reducing the abnormalities to three instead of increasing them to five, as does an anastomosis, but these direct operations are still in the experimental stage. The gratifying results of the anastomotic operation, as reported by Campbell and Deuchar in the longest series yet published in this country, confirm the reputation of this procedure.

MODERN YAWS CONTROL

The First International Symposium on Yaws Control was held in March, 1952, at Bangkok under the auspices of the World Health Organization with the assistance of the United Nations International Children's Emergency Fund and the Government of Thailand. Over 30 papers were presented, and collected summaries of these papers and the related discussions have been made available in duplicated form by the W.H.O. This symposium marks the coming of age of yaws and the passing of its control from the enthusiastic amateur to the professional slayer of dragons. With this evolution the technique of control has changed from one of individual fancy to one based on scientific principles, though there are still some aspects of yaws that remain to be carefully studied.

Great changes have come about since the discovery of penicillin, and especially since the development of long-acting penicillin preparations such as procaine penicillin in aluminium monostearate (P.A.M.). In the past anti-yaws campaigns by mass treatment have often been made ineffective by the failure of the patients to attend long enough to receive adequate treatment, though in some areas the incidence of yaws has been greatly reduced after several years of free, rather haphazard bismuth injections. The optimal dose of P.A.M. that will render non-infectious the largest number of patients with infectious yaws lesions is not yet known for certain, but it is probably not more than 2.4 million units in one or two injections.

The modern effective anti-yaws campaign is no beginner's exercise. It must be initiated by a census and survey of the whole population, and six to twelve months after the campaign there must be another survey to assess the results. This may sound academic to the "practical" man, but there have unfortunately been recent anti-yaws campaigns whose effectiveness no one has been able to assess, and only good results, properly confirmed, can justify the expenditure of effort and money. In modern anti-yaws campaigns much, if not all, the work of surveying, diagnosis, and treatment is being done by selected local lay people after a short period of practical training. General supervision is by a doctor trained in public health and familiar with the problems of yaws control.

An important problem is to decide who is to receive treatment. An effective campaign is a public health measure and is not concerned only with the treatment of patients with yaws, though for practical reasons a certain amount of this may be necessary. There is no doubt that in an anti-yaws campaign previously uninfected contacts of patients with infectious lesions should be treated, perhaps with a smaller dose. But more important numerically and from other points of view are those patients who, having had an attack of early, secondary, or infectious yaws, have no clinical manifestation of yaws at the time they are examined. If untreated, many are certain to relapse during the following year or so and thus infect the uninfected and cured members of the population. At present there is no infallible way of detecting these latent secondary cases, which potentially, at least, cease to be a danger only when they develop late or tertiary destructive lesions or undergo spontaneous cure with serological reversal. The most practical way of reducing this menace is to treat all persons who give a history of having had yaws during the previous five years.

Two other important aspects of yaws control, originally found by Harding,[1] were emphasized at the Bangkok conference. One is that mass treatment

[1] *Trans. roy. Soc. trop. Med. Hyg.*, 1949, **42**, 487.